EE331 LAB 3: SERIES-PARALLEL CIRCUITS

Name:_____ Section:_____ Date:_____

OBJECTIVES:

At the conclusion of this lab exercise you should be able to:

1. Predict and measure node voltages and branch currents for a series–parallel network of resistors.

2. Verify KVL, KCL, and the principles of voltage and current division through the measurement of resistance, current, and voltage.

REFERENCES: (a) *Core Course Laboratory Manual*, 199**9**.
(b) Hambley, *Electrical Engineering Principles and Applications;* Prentice Hall, 2nd Edition.

EQUIPMENT: HP3468A multimeter
Dual DC Power Supply (PS1)
2 Variable Resistor Decade Boxes
Resistors: 100 Ω, 220 Ω, 330 Ω, 470Ω, 1kΩ, 2kΩ

SIGNALS: None

1. Measure and record the values for the resistors you have been supplied in Table 1.

	Color Code				Nominal Value	Measured Value	% Difference	Within tolerance?
R_1					1kΩ			Y/N
R_2					100Ω			Y/N
R_3					470Ω			Y/N
R_4					330Ω			Y/N
R_5					2kΩ			Y/N
R_6					220Ω			Y/N

Table 1

* % Difference = (DMM Measured Value - Nominal Value) x 100% (Negative % => Low)
Nominal Value (Positive % => High)

2. "**VIP**" the circuit in Figure 1. Assemble the circuit on your quad board. Measure all currents and voltages. Enter your experimental results in the left hand column of Table 2. Enter your prelab values in the right hand column of Table 2.

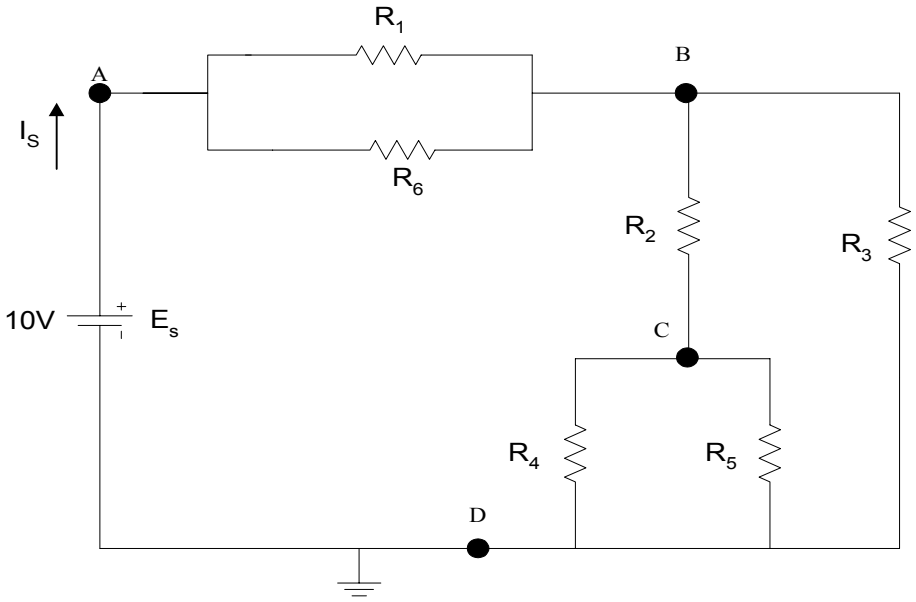

Figure 1

	Voltage (exp)	(prelab)	Current (exp)	(prelab)	Power (exp)	(prelab)
E_s						
R_1						
R_2						
R_3						
R_4						
R_5						
R_6						

Table 2

3. Measure the following node voltages:

V_A = _____ V_B = _____ V_C = _____ V_D = _____

(prelab values) V_A = _____ V_B = _____ V_C = _____ V_D = _____

4. Set the variable decade resistance boxes to the values you determined for R_{EQ1} and R_{EQ2} in your prelab. Using the variable decade resistance boxes, replace resistors R_1 and R_6 with R_{EQ1}; and R_2, R_4, and R_5 with R_{EQ2}. Be sure to measure the resistance of the decade box to verify that you have the desired equivalent resistance before connecting the box to the quad board. "VIP" the circuit in Figure 2. Measure all currents and voltages. Enter your experimental results in the left hand column of Table 3. Enter your prelab values in the right hand column of Table 3.

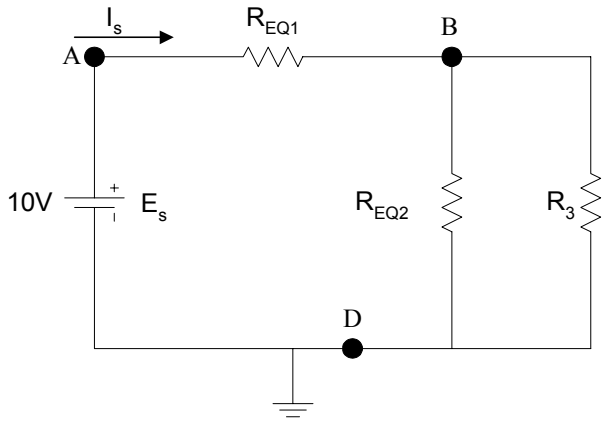

Figure 2

	Voltage (exp)	(prelab)	Current (exp)	(prelab)	Power (exp)	(prelab)
E_s						
R_{EQ1}						
R_{EQ2}						
R_3						

Table 3

5. Measure the following node voltages:

V_A = _____ V_B = _____ V_D = _____

(prelab values) V_A = _____ V_B = _____ V_D = _____

6. Rebuild the circuit of Figure 1, but move the common ground for the circuit to Node B as shown in Figure 3. For this part of the experiment, the "-" side of the supply voltage must NOT be connected to earth ground

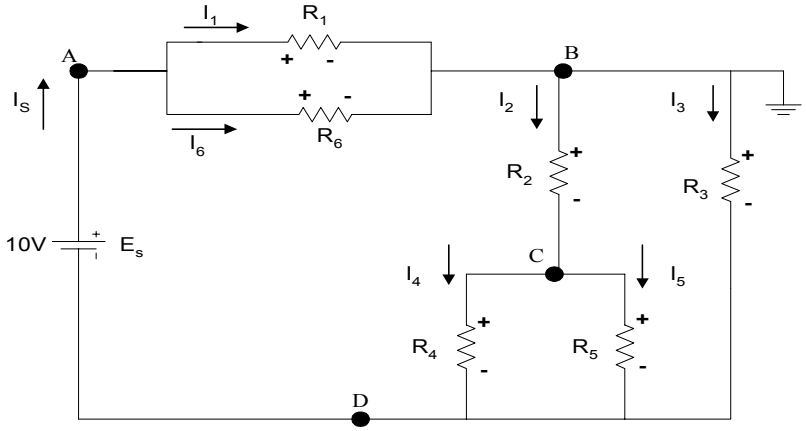

Figure 3

7. Measure the following node voltages:

V_A = _____ V_B = _____ V_C = _____ V_D = _____

(prelab values) V_A = _____ V_B = _____ V_C = _____ V_D = _____

8. QUESTIONS

a. Using your experimental results in Table 2, show that KCL held true at Node B.

b. Using your experimental results in Table 2, show that KVL held true for the loop defined in your prelab (prelab Figure 3).

c. Using your experimental results in Table 2, show that power supplied equals power dissipated.

d. Using your experimental results in Table 3, show that KCL held true at Node B.

e. Using your experimental results in Table 3, show that power supplied equals power dissipated.

f. Using the node voltage values you measured in part 7 (with the ground at Node B), determine the value of the voltage across resistors R_2 and R_4.

V_{R2} _____ V_{R4}_____

g. How do the values you determined above for V_{R2} and V_{R4} compare to the values you measured in Table 2 with the ground located at Node D?

h. Did moving the ground from Node D to Node B change the amount of current following through resistors R_2 and R_4? Explain.